Dr. Tardiff's comparison of the Synthesis Model with Verizon's embedded network, Verizon Exh. 108 (Tardiff Reb.) at 35-43, does nothing to undercut the validity of the Synthesis Model. There is nothing forward-looking about Verizon's embedded network. Indeed, by definition, it is a backward-looking network reflecting the compromises and work-arounds that characterize a monopoly provider offering universal service, AT&T/WCOM Exh. 14 (Pitkin Surreb.) at 26. For this reason, this Commission has repeatedly rejected the use of embedded costs in determining a provider's forward-looking costs.

> We do not agree, as some parties have argued, that the models' outside plant design parameters should be verified by comparing the design of the model networks in specific locations to the design of incumbent LECs' existing plant in those locations in all cases. [T]he design of the existing networks under these conditions may not represent the least-cost, most-efficient design in some cases. The Commission, in the *Universal Service Order*, adopted the Joint Commission's recommendation that universal service support should be based on forward-looking economic costs. . . . [W]e do not believe that a forward-looking platform can meaningfully be verified by comparing its network to an embedded network.

Universal Service Fifth Order at ¶ 66. *See also Local Competition Order,* ¶ 250, Criteria 3 ("the costs *must* not be the embedded cost of the functions, or elements"); AT&T/WCOM Exh. 14 (Pitkin Surreb.) at 26-28.

In making his comparisons of Verizon's embedded network with the Synthesis Model, Dr. Tardiff also relies on ARMIS data that contain various investments and costs that are not causally attributable to the provision of UNEs. AT&T/WCOM Ex. 14 (Pitkin Surreb) at 27-28. These costs include, for instance, DSLAMs and other costs to upgrade narrowband loops to offer broadband services, investment in capacity acquired in anticipation of providing interexchange service, and retail costs such as marketing and most product management expenses. *Id.* The Synthesis Model appropriately assigns significant fractions of many

categories of general support and overhead investment and expenses, such as those associated with buildings, land, furniture, and general purpose computers to such activities, and excludes them from the Model's calculations. Attribution of such costs to the particular network elements costed by the Synthesis Model would violate the causation requirement of TELRIC. *Local Competition Order* at ¶¶ 682, 691. Dr. Tardiff, however, made no attempt to back out any of these extraneous costs before performing its cost comparisons with the Synthesis Model outputs. AT&T/WCOM Ex. 14 (Pitkin Surreb.) at 28; AT&T/WCOM Exh. 20 (Murray Surreb.) at 33-37.[34]

2. The Verizon Models

The choice of the appropriate cost model in this proceeding has important implications. Whatever model is used to determine the costs of UNEs and interconnection will be used by the Commission, as well as the parties, to assess whether future changes in market conditions and costs warrant modifications to the rates the Commission will set in this proceeding. To make such an assessment, the Commission and competing carriers need a cost model that is transparent, verifiable and susceptible to adjustment. Verizon's cost models do not satisfy these basic criteria.

Unlike the Synthesis Model, Verizon's models and inputs violate basic TELRIC principles. Verizon's cost studies use inputs based on its embedded or historical network and

---

[34] The investments and expenses calculated by the Synthesis Model, by contrast, pertain only to the set of UNEs at issue in the proceeding, and thus exclude the forward-looking costs of certain *other* UNEs. The costs modeled by the MSM, for example, exclude the investment in facilities used to provide DS-3 and other broadband services to customers. Nor do they even necessarily cover all the narrowband services, since, for instance, the Model does not have information on alarm circuits and other intraLATA dedicated circuits the companies may be offering. AT&T/WCOM Ex. 14 (Pitkin Surreb.) at 28. Attribution of such costs to the subset of Verizon's network elements costed by the Synthesis Model would also violate the causation requirement of TELRIC. Verizon, however, made no attempt to back out any of these extraneous costs before performing its cost comparisons with the Synthesis Model outputs.

costs, and, consequently produce costs that are not forward-looking at all. Mindful that the term "embedded" is a red flag, Verizon regularly employs the term "actual"[35] costs as a euphemism for embedded costs. No such sleight of hand, however, can obscure the fact that Verizon's models violate basic TELRIC principles and produce grossly inflated UNE recurring rates. AT&T/WCOM Ex. 12 (AT&T/WorldCom Recurring Cost Panel Reb.) at 5.

a. Description of Verizon's Models.

Verizon's recurring cost studies are based upon Verizon's loop cost analysis model ("LCAM") and interoffice transport model. Verizon Exh. 107 (Verizon Panel Dir.) at 32. In developing its UNE costs, Verizon also used the Switching Cost Information Systems ("SCIS") model, as well as the Common Channel Signaling Cost Information System ("CCSCIS"). *Id.*

Verizon's loop costs are processed through LCAM, which is composed of three modules (*i.e.* Plant Characteristics, Electronics, and Loop Study modules). The Plant Characteristics Module produces average feeder and distribution loop lengths, cable feeder sizes, and outside plant mix, which are derived from an engineering survey of Verizon's outside plant conducted from 1993 to 1995. Verizon's cable cost and labor inputs to this module are derived from the Vintage Retirement Unit Cost system ("VRUC"). Although the data in Verizon's VRUC database ostensibly reflect Verizon's installed cable costs from 1997 through 1999, the reality is that the cable costs in Verizon's models are estimates only. AT&T/WCOM Exh. 12 (AT&T/WorldCom Recurring Cost Panel Reb.) at 33.

The Electronics Module develops investment costs for Next Generation Digital Loop Carrier ("NGDLC") hardware and common equipment for transmission of voice grade

[35] Verizon Exh. 107 (Verizon Panel Dir.) at 39; Verizon Exh. 122 (Verizon Recurring Cost Panel Surreb.) at 115, 119, 141.

over fiber facilities and sizes the remote terminal based on working lines. Fiber feeder facilities that are provisioned with NDLC are placed when the feeder loop length exceeds the copper/fiber threshold. *Id.* at 7-8.

Verizon's Loop Study Module summarizes the results of the Plant Characteristics and Electronic modules to generate loop investment by wire center. *Id.* at 8; Tr. 4338-4341 (Sanford).

Verizon's recurring cost studies proceed in the following major steps. First, Verizon identifies the material investments in its so-called forward-looking network and develops a "material-only investment" which is divided by the total available unit of capacity to derive a material-only investment per available unit. Verizon Exh. 107 (Verizon Panel Dir.) at 18, 30.

Second, Verizon then applies utilization factors to this investment figure to obtain a "materials-only investment per unit of the element in service." *Id.* at 34 (footnote omitted). In most cases, Verizon's utilization factors are based upon its current utilization rates. Verizon Exh. 122 (Verizon Recurring Cost Panel Surreb.) at 115; Tr. 4108-4109 (Sanford).

Third, Verizon applies "investment loading factors," which are ostensibly designed to produce the "total installed costs" of an asset. Verizon Exh. 107 (Verizon Panel Dir.) at 18, 30, 41. These investment loadings purportedly account for engineering and installation ("EF&I") costs, land and building costs relating to material investment, and the costs of equipment used to power installed equipment and facilities. *Id.* at 18, 30. Verizon's EF&I factors are developed from data in Verizon's Detailed Continuing Property Record ("DCPR") database, which contains information relating to plant installed in calendar year 1998. *Id.* at 43.

Fourth, after calculating its "total installed costs," Verizon then applies annual cost factors ("ACFs") produced by Verizon's VCost model that calculate the forward-looking

costs associated with the investment in the particular plant. *Id.* at 49. The ACFs that Verizon uses in its cost studies include those for depreciation, taxes, network operations, support expenses, return on investment, and various administrative and marketing expenses. *Id.* at 49-50. AT&T/WCOM Exh. 12P (AT&T/WorldCom Recurring Cost Panel Reb.) at 8.

Fifth, Verizon's applies its ACFs to convert incremental UNE investments to annual recurring costs for each network element. The total annual cost is then converted to a monthly recurring UNE rate. AT&T/WCOM Exh. 12P (AT&T/WorldCom Recurring Cost Panel Reb.) at 8; Verizon Exh. 107 (Verizon Panel Dir.) at 18.

b. Difficulties in Evaluating Verizon's Models.

Verizon's cost models, which run on an Oracle interface, are quite cumbersome and difficult to analyze. AT&T/WCOM Exh. 15P (Baranowski Surreb.) at 2.[36] Unlike a standard spreadsheet application that permits the user to highlight a cell and examine a given formula, the obsolete Oracle software interface for LCAM displays only a list of formulas within a module, and intermediate model runs can be examined only at certain stages of the model run process. AT&T/WCOM Exh. 12P (AT&T/WorldCom Recurring Cost Panel Reb.) at 9-10. In addition, because revisions to any formulas or the creation of any new formulas can be effected only through a special procedure, the process of making any adjustments to Verizon's algorithms is time-consuming and complex. *Id.* at 10. For these reasons, although AT&T and WorldCom have found certain errors in Verizon's model, other errors may exist that remain undetected. *Id.*

Verizon's models also suffer from a number of other infirmities that render it impossible to discern the basis upon which Verizon's rates are calculated. Unlike the Synthesis Model that develops all of the investments associated with each asset in the model,"[37] Verizon's

[36] Verizon's models can be run only by using a licensed version of Oracle software that is no longer available for purchase. *Id.*

[37] Tr. 4343, 4345 (Pitkin).

models make no attempt to model the costs of the entire network engineered from the ground up. *See* Tr. 4340-4341 (Sanford), Tr. 4345-46 (Pitkin). Indeed, instead of calculating each asset that is required for the network, Verizon applies various cost additives to investments, thereby shrouding in secrecy key inputs to its cost models. Tr. 4345 (Pitkin); Tr. 4370-4371 (Baranowski). Verizon's cost models are otherwise designed in such a manner that it is difficult to test their underlying assumptions. AT&T/WCOM Exh. 12 (AT&T/WorldCom Recurring Cost Panel Reb.) at 16.

Thus, for example, Verizon's loaded investment cable price purportedly includes all of the costs that are required to provision cable, including engineering and installation costs, as well as the investments for the drop, NIDs, and SAI boxes. Tr. 4367 (Sanford); Verizon Exh. 107 (Verizon Panel Dir.) at 118. However, Verizon's models are difficult to analyze because they do not identify the specific costs associated with each discrete component in Verizon's loaded investment cable price. Tr. 4370-4371 (Baranowski); AT&T/WCOM Exh. 12 (AT&T/WorldCom Rebuttal Cost Panel Reb.) at 8-9.

Similarly, Verizon insists that the net investments in its models accurately reflect any reduced structure costs attributable to structure sharing agreements. Unfortunately, Verizon's models are constructed in such a manner that it is impossible to discern the precise costs that are attributable to Verizon's structure sharing arrangements with other users. Tr. 4377-79 (Baranowski); Tr. 4379-80, 4390 (Gansert).

Further, Verizon applies its EF&I loading factor to its DLC equipment costs – a loading factor that Verizon claims properly accounts for the cost of installation. However, Verizon's model is constructed so that it is impossible to trace the installation costs associated with each piece of equipment reflected in its EF&I loadings. AT&T/WCOM Exh. 12P (AT&T/WorldCom Recurring Cost Panel Reb.) at 74-75.

Because of these limitations in Verizon's cost models, Verizon's claim that the assumptions and inputs to its models can be changed with a simple press of a button is demonstrably false. *Cf.* Verizon Exh. 107 (Verizon Panel Dir.) at 100. Verizon's models are not verifiable. Key inputs are undocumented, and many key algorithms cannot be modified. Tr. 4378-79 (Baranowski).

c. Verizon's Non-TELRIC Compliant Rates.

More fundamentally, Verizon's models cannot properly be used as the basis for determining UNE rates in this proceeding because they violate basic TELRIC principles. TELRIC requires the calculation of forward-looking economic costs based on a "reconstructed local network" that uses the most efficient, commercially available technology to meet current and reasonably foreseeable demand, constrained only by the locations of Verizon's wire centers. Both the recurring study and the non-recurring study start with Verizon's existing network today, and, for the most part, model the additions Verizon will likely make to that network over the next three years. The recurring cost study then assumes that the *entire* network, serving the demand Verizon anticipates it will face in Virginia in three years, will comprise a mix of equipment identical to that Verizon intends to purchase over the next three years. No explanation is given as to why Verizon believes the incremental equipment Verizon purchases over the next three years to add to its existing network could possibly serve as a useful model of the entire inventory of equipment a carrier would use to serve total output in Virginia. For example, the mix of switch add-ons, upgrades and replacement switches Verizon happens to purchase over the next three years bears no obvious relation to the mix of switching equipment that actually is in Verizon's network, or in any network sized to serve all of Virginia. It was that feature of the study that Dr. Shelanski pointedly refused to characterize as rational. Tr. 2949 (Shelanski).

The major differences between Verizon's and AT&T/WorldCom's cost estimates result from different input values. In violation of forward-looking cost principles, Verizon's recurring cost studies are inextricably linked to its existing embedded network, thus depriving the network of productivity gains and efficiencies that would be available under properly-developed, forward-looking TELRIC costs in a scorched-node environment, and undermining TELRIC's goal of identifying the true cost of network elements. *See, e.g.,* AT&T/WCOM Exh. 12P (AT&T/WCOM Recurring Cost Panel Reb.) at 5. The fact that Verizon's cost models rely on its embedded network as the baseline for developing rates is evident from the testimony of Verizon's witnesses, as well as the recurring cost study itself.

The cornerstone of Verizon's loop cost study is the outside plant engineering survey of its embedded outside plant conducted between 1993 and 1995[38] -- a survey that was conducted well before the Telecommunications Act of 1996. *See, e.g.*, Tr. 4352-4353 (Gansert); AT&T/WCOM Exh. 15P (Baranowski Surreb.) at 9; Verizon Exh. 107 (Verizon Panel Dir.) at 121. This engineering survey serves as the basis for a number of assumptions in Verizon's cost models, including the mix of cable support structure – buried, underground and aerial – and sharing of structure with other utilities and users. AT&T/WCOM Exh. 11 (Murray Reb.) at 28; Verizon Exh. 122 (Verizon Recurring Cost Panel Surreb.) at 60; Tr. 4025 (Gansert). Verizon's engineering survey – which elicited nothing more than guesses about Verizon's outside mix – could not possibly capture accurate information regarding Verizon's embedded outside plant.

[38] Notably, AT&T Exh. 112 (AT&T/WorldCom Request 1-34) requested that Verizon produce documents relating to Verizon's engineering survey. However, the only documents that Verizon produced were the survey instructions. Tr. 4028-4038 (Sanford). Verizon never produced feeder routes, customer location information, maps, plats or any other detailed information regarding Verizon's outside plant facilities. *See* AT&T/WCOM Exh. 12P (AT&T/WorldCom Recurring Cost Panel Reb.) at 16. The record thus is devoid of the information needed to test Verizon's claims regarding the purported efficiencies of its existing routes configuration.

Most important, Verizon's reliance on its engineering survey to develop a forward-looking plant mix is misplaced. The engineering characteristics of Verizon's embedded outside plant during the early 1990's would not be the same as those of an entrant that deploys the most efficient network architecture to serve Verizon's current and reasonably foreseeable demand. AT&T/WCOM Exh. 11 (Murray Reb.) at 28-29; AT&T/WCOM Exh. 15P (Baranowski Surreb.) at 5-6. Moreover, the survey does not even accurately describe Verizon's outside plant. For example, the survey asked respondents for the predominant structure of a particular UAA and presumed that such structure applied for that entire UAA. Thus, if all UAAs had 80% buried plant, Verizon's survey results would show 100% buried plant.

Similarly, Verizon's arbitrary assumptions about cable size -- which are grounded in the same flawed engineering survey[39] -- are also erroneous. That survey was not designed to determine the forward-looking size of cable and does not even provide reliable estimates of embedded cable size. The survey instructions alone render the study results worthless. The instructions asked each study respondent to "[c]hoose a cable sheath that is typical within the UAA section length." *See* AT&T/WCOM Exh. 12P (AT&T/WorldCom Recurring Cost Panel Reb.) at 13. However, the instructions did not define "typical." Instead, they merely suggest that the "last cable placed for a predominant length within the feeder portion of the UAA section may be a good surrogate" for the typical size in the section, but did not require survey respondents to adopt this assumption. *See* AT&T/WCOM Exh. 112 (Response to AT&T/WorldCom 1-34). *See also* AT&T/WCOM Exh. 12P (AT&T/WorldCom Recurring Cost Panel Reb.) at 13. Accordingly, the survey results could not possibly capture accurate information regarding the cable sizes in Verizon's embedded network. Moreover, Verizon's cable unit prices that are based upon cable sizing algorithms in Verizon's loop cost model and

[39] *See* Verizon Ex. 122 (Verizon Cost Panel Surreb.) at 60; Tr. 4025 (Gansert).

Verizon's 1997 through 1999 historical cable installations clearly reflect Verizon's embedded costs – costs which do not comply with the "scorched node approach" mandated by the Commission. *Local Competition Order* ¶ 685; AT&T/WCOM Exh. 15P (Baranowski Surreb.) at 5-6.

Furthermore, the loop lengths used in Verizon's models are based upon Verizon's engineering survey. Verizon has offered no probative evidence that the existing route configuration in its embedded network is the least cost, most efficient route configuration that would be used by an efficient, competitive company in a forward-looking environment. AT&T/WCOM Exh. 12P (AT&T/WorldCom Recurring Cost Panel Reb.) at 15-16.

Verizon's assumptions regarding its forward-looking technology mix are also constrained by the limitations of its embedded network. For example, the percentage split between IDLC and UDLC in Verizon's cost studies is based on Verizon's embedded network. AT&T/WCOM Exh. 11) (Murray Reb.) at 14; AT&T/WCOM Exh. 12P (AT&T/WorldCom Recurring Cost Panel Reb.) at 22. For those lines that are provisioned with IDLC, Verizon assumes that the vast majority will be provisioned with the less-efficient TR-008 interface, instead of the state-of-the art GR-303 interface. AT&T/WCOM Exh. 11 (Murray Reb.) at 24-25; AT&T/WCOM Exh. 12P (AT&T/WorldCom Recurring Cost Panel Reb.) at 19-24. However, Verizon's embedded network, which includes a mix of older technologies that have evolved over the years, cannot possibly mirror the technology mix that an efficient entrant would deploy with a reconstructed local network that uses the most efficient technology available. AT&T/WCOM Exh. 12P (AT&T/WorldCom Recurring Cost Panel Reb.) at 22; AT&T/WCOM Exh. 11 (Murray Reb.) at 16, 18, 25. Clearly, the most efficient, forward-looking digital loop carrier technology

available is the IDLC system that uses a Time Slot Interchange with a GR-303 interface. AT&T/WCOM Exh. 12P (AT&T/WorldCom Recurring Cost Panel Reb.) at 23.[40]

Additionally, Verizon inappropriately relies on its embedded network when modeling the size and type of digital loop carriers electronics. By matching current working line information by existing carrier service area ("CSA") and distribution area ("DA") with engineering survey data instead of actual customer locations, Verizon virtually assures that its purported forward-looking network will mirror its embedded facility. Verizon's approach also guarantees that it cannot take advantage of the efficiencies of DLC technology. AT&T/WCOM Exh. 12P (AT&T/WorldCom Recurring Cost Panel Reb.) at 17-18.

Another critical failure of the Verizon cost models is that the recurring and non-recurring models are based on incompatible assumptions, and as a result prices set in reliance on both studies necessarily overstate costs. As indicated above, the recurring study purportedly models changes to Verizon's network over the next three years, and then makes the indefensible assumption that all of Virginia's customers are served by a mix of network equipment that Verizon happens to deploy over that period. Verizon's NRC model, on the other hand, models the mix of equipment that will actually be deployed in Verizon's network at the end of the three year period.[41] Thus, for example, if 80% of the DLC Verizon will deploy over the next three

---

[40] Indeed, Telcordia decided to model only GR-303 – and not TR-008 – in connection with the SM-2000 Lucent switch module. AT&T/WCOM Exh. 24P (Pitts Supp. Surreb.) at 6.

[41] Verizon's justification for this irrational combinations of models is that if its NRC model assumed a network comprised of the most efficient available technology, as TELRIC required, there would be no way for Verizon, operating with a mix of old and new technology, to recover its actual expenses. Verizon Ex. 101 (Shelanski Dir.) at 34. Of course, in a competitive world, if Verizon faced a competitor that had lower operating costs because it had a more modern network, Verizon would have to lower its rates to match that competitor, and it would have to do so whether the lower costs of its competitor were the result of lower capital costs or lower operating costs. More to the point, the premise of this argument is that TELRIC is unfair and

years will be IDLC, and if at the end of that period, 40% of the installed base of DLC will be IDLC, Verizon's recurring cost model will model 80% IDLC, while the non-recurring model will model 40% IDLC.

These different modeling assumptions at the very least yield an irrational result. As Verizon's own witness Dr. Shelanski testified, it makes no sense to do what Verizon's models do – consider the value of a product without considering *both* capital and operating expenses together. *See, e.g.,* Tr. 3067-3068 ("I can't actually tell you what the value of the analog switch is based solely [on the price of the original switch and the price of a switch that currently provided the same functionality] because I would have to know something about the difference in the serving and operating and maintenance costs."). Because the two models price entirely different networks, together they cannot possibly rationally calculate cost.

Moreover, Verizon's irrational assumptions almost certainly overstate costs. One of the principal reasons any carrier deploys new technology is that it lowers operating and repair costs, the kinds of costs captured in the NRC model. Indeed, carriers might well purchase more expensive equipment because operating with that equipment will lower operating costs. So it is likely that Verizon models a high percentage of higher capital cost equipment in its recurring cost model, because that equipment will allow it to operate more efficiently, while modeling a much lower percentage of that equipment in its NRC model. Competitors thus pay in the recurring model for Verizon's capital costs necessary to obtain lower operating costs, and then do not obtain the benefit of those lower operating expenditures in the non-recurring model. The models leave competitors the worst of both worlds.

---

that Verizon therefore choose a non-TELRIC model, and that is reason enough to reject Verizon's model.

For all of these reasons, Verizon's cost models ultimately produce grossly overstated recurring rates for UNEs that, if approved by the Commission, would become insurmountable barriers to competitive entry. The inevitable impact of adopting Verizon's proposed rates is to preserve and perpetuate its local monopoly. As a consequence, the Commission should reject Verizon's cost models.

C. Cost of Capital

1. Background.

One of the costs of a network element is the "cost of capital," or return on investment, sufficient to compensate lenders and equity investors for the capital invested in the assets needed by an efficient supplier of the network element. *Local Competition Order* ¶ 700; *Bell Atlantic-Delaware*, 80 F.Supp.2d at 239. The necessary rate of return in turn depends on investors' perceptions of the risks that such a firm would face in its network element business. *See FPC v. Hope Natural Gas Co.*, 320 U.S. 591, 603 (1944). For UNE pricing, the allowed cost of capital must reflect only the risks of providing the network elements, and not the higher risks of providing retail-related costs, for those costs "are not attributable to the production of network elements that are offered to interconnecting carriers and must not be included in the forward-looking direct cost of an element." *Local Competition Order* at ¶¶ 691, 700; *accord*, *Bell Atlantic-Delaware*, 80 F.Supp.2d at 240.

Because the provision of local telephone service is capital intensive, the cost of capital is an important part of overall costs under TELRIC. If capital costs are overestimated, TELRIC prices will be too high. Excessive capital costs will therefore have the effect of deterring competition, encouraging inefficient construction of bypass facilities by entrants and generating improper subsidies for the ILEC.

The cost of capital issue in this proceeding is largely a reprise of the same issue in the 1996-97 UNE litigation in Virginia and elsewhere in Verizon's service area. In the earlier proceedings, AT&T, relying on a cost of capital analysis sponsored by Mr. John Hirshleifer, Professor Bradford Cornell, or Professor Glenn Hubbard (now Chairman of the President's Council of Economic Advisors), proposed a weighted average cost of capital in the range of 10 percent. Verizon, relying on an analysis by Professor James Vander Weide, proposed a figure of 13.2 percent. 12 Tr. 3421-22 (Vander Weide). The Virginia SCC, generally adopting Mr. Hirshleifer's assumptions and rejecting Professor Vander Weide's, adopted a weighted average cost of capital of 10.12 percent. Order, Case No. PUC970005, at 11 (Va. SCC May 22, 1998) at 6 (10.12 percent).

In resolving the dispute in this way, the Virginia SCC was joined by nearly every other state commission in Verizon's service area where Mr. Hirshleifer, Prof. Cornell or Prof. Hubbard testified for AT&T against Dr. Vander Weide during the 1996-97 period. In no case where these witnesses testified against Dr. Vander Weide did the state commission adopt his cost of capital estimate. 12 Tr. 3422-26 (Vander Weide). In most of the proceedings, the cost of capital adopted by the state commission was on the order of 10 percent, close to what Mr. Hirshleifer, Prof. Cornell and Prof. Hubbard proposed. *See, e.g.*, Order, Case No. 8731, at 29 (Md. PSC Sept. 22, 1997) (10.1 percent); Findings and Recommendations of Hearing Examiners, Delaware PSC Docket No. 96-324, ¶¶ 68 (De. PSC Apr. 7, 1997) (10.28 percent), *affirmed*, Order No. 4542, at ¶ 29 (De. PSC July 8, 1997), *affirmed*, *Bell Atlantic-Delaware, Inc. v. McMahon*, 80 F.Supp.2d 218, 239-41 (D.Del. 2000); Compliance order, Docket No. TO00060356, at 2 (New Jersey BPU, Nov. 30, 2001) (8.82 percent—i.e., *lower* than the value proposed by Mr. Hirshleifer for AT&T).[42]

[42] Dr. Vander Weide came closest to success in Massachusetts, where the state commission adopted a cost of capital of 12.16 percent. The FCC has made clear, however, that it regards this

2. Description of the parties' cost of capital studies in this case.

a. AT&T/WorldCom Witness John Hirshleifer

In the present proceeding, AT&T and WorldCom, relying on a cost of capital analysis by Mr. Hirshleifer, have proposed a weighted average cost of capital of 9.54 percent. The change from the 10.01 percent value he sponsored in 1997 is due largely to intervening changes in the current cost of debt and equity; the methodologies of the two studies are essentially the same.

For his analysis of the equity component of capital, Mr. Hirshleifer selected a DCF comparison group of four large, publicly traded telephone holding companies with major interests in local telephone networks. AT&T-WCOM Exh. 5 (Hirshleifer Dir.) at 7-8 & Attachment JH-2. Currently, there are no "pure-play" companies operating exclusively as a

---

value as questionable, and the Massachusetts DPU has reopened the record for further proceedings on this and other issues. *See* FCC CC Docket No. 01-9, *In the Matter of Application of Verizon New England, Inc., et al., for Authorization to Provide In-Region InterLATA Services in Massachusetts*, Memorandum Opinion and Order rel. April 16, 2001 ¶ 38 (expressing concern that Massachusetts DPU used a "relatively high" cost of capital of 12.16 percent, a value "substantially higher than the cost of capital employed by any of the other states in Verizon's region"); *id.* at ¶ 251 (citing cost of capital rate as one of the "potential flaws" in Verizon's cost study that, "if repeated without justification, could result in UNE rates that warrant enforcement action" by the FCC).

Dr. Vander Weide's next most successful effort was in Pennsylvania, where the state PUC adopted a weighted average cost of capital of 11.9 percent, AT&T and MCI challenged this value as excessive and contrary to TELRIC principles, and the reviewing court remanded this aspect of the PUC's decisions for reconsideration in light of the August 8, 1996 Order. *See MCI Telecommunications Corp. v. Bell Atlantic-Pennsylvania, Inc.*, Civil No. 1:CV-97-1857 (M.D. Pa., June 30, 2000), Memorandum and Order at pp. 10-13. The PUC eventually agreed, finding in 1999 that the 1996 Bell Atlantic/NYNEX merger proxy statement showed that "an 11.9 percent cost of capital is no longer appropriate," and that the 9.83 percent value sponsored by AT&T/MCI witness Cornell "is a more reasonable assumption at this time." *Nextlink Pennsylvania, Inc.*, 196 P.U.R.4th 172, 210 (1999) ("*Global Order*").

wholesale provider of unbundled network elements; indeed, there are few if any publicly traded firms that provide only local telephone service. The most comparable companies are the large regional telephone holding companies ("RHC"s), which have been required to provide unbundled network elements at wholesale. Because RHCs currently engage in more risky businesses of selling retail phone service, cellular service, paging, information services, long-distance, cable and the like, using these companies as comparables leads to cost of capital estimates that are necessarily conservative (*i.e.*, too high). AT&T-WCOM Exh. 5 (Hirshleifer Dir.) at 4, 7-8, 37, 40-43; AT&T-WCOM Exh. 17 (Hirshleifer Surreb.) at 33-35.

To estimate the cost of equity of the companies in this comparison group, Mr. Hirshleifer used two alternative methodologies: (a) a three-stage discounted cash flow ("DCF") methodology based on the future dividends for the comparable group of companies identified in step one; and (b) the capital asset pricing model ("CAPM"), in which he calculated a "risk premium" for the comparable companies (based on their price volatility in relation to other stocks), which he then added to a risk free rate of return. AT&T-WCOM Exh. 5 (Hirshleifer Dir.) at 10-34. The result was a cost of equity in the range of 10.6 percent. *Id.* at 19-34.

For the cost of debt, Mr. Hirshleifer used reported data on the forward-looking debt costs incurred by Bell Atlantic as of June 30, 2000. From these data he obtained a debt cost of 7.86 percent. *Id.* at 8-10.

Finally, Mr. Hirshleifer determined a weighted average of the debt and equity costs by determining the average book capital structure (debt-equity) ratio of the companies in the group, and by determining the average market-weighted capital structure. Using the midpoint of the results two capital structures yielded a weighted average cost of capital of 9.54 percent, with an implicit debt/equity ratio of 34.5/65.5 percent. *Id.* at 34-39; AT&T-WCOM Exh. 10 (Hirshleifer Reb.) at 31-34; AT&T-WCOM Exh. 17 (Hirshleifer Surreb.) at 53-60.

b. Verizon Witness James Vander Weide

Verizon, for its part, has chosen to stand pat with the same inflated assumptions previously proposed by Dr. Vander Weide and rejected by most state commissions. With his current data, he derives a cost of capital of 12.95 percent. Verizon Exh. 112 (Vander Weide Reb.) at p. 4; 12 Tr. 34212-22 (Vander Weide); AT&T-WCOM Exh. 10 (Hirshleifer Reb.) at 10.

Dr. Vander Weide again relies for his cost of equity estimate on a single-stage DCF model, which assumes that the above-average growth rates projected by analysts over the next 3-5 years for the companies in his comparison group will continue forever. AT&T-WCOM Exh. 10 (Hirshleifer Reb.) at 10-17. And he continues to uses a comparison group for his DCF analysis consisting of approximately 110 of the 400 nonfinancial companies in the S&P 500 Industrial list, the vast majority of which are engaged in lines of business unrelated to the wholesale business of supplying unbundled network elements. Verizon Exh. 112 (Vander Weide Reb.) at 38-39; AT&T-WCOM Exh. 10 (Hirshleifer Reb.) at 17-18; AT&T-WCOM Exh. 17 (Hirshleifer Surreb.) at 35-36. From these procedures, Dr. Vander Weide obtains an equity cost of 14.75 percent. AT&T-WCOM Exh. 10 (Hirshleifer Reb.) at 10.

In estimating the cost of debt, Dr. Vander Weide has used a cost of debt reported by Moody's for long term A-rated bonds, or 7.55 percent. Verizon Exh. 104 (Vander Weide Dir.) at 45-46.

Finally, Dr. Vander Weide uses debt-equity ratios based on the market weighted capital structures for the group of S&P Industrial companies; a group of telephone holding companies that own local exchange carriers; and a group of telephone holding companies that own interexchange carriers. He made no adjusted to the resulting capital structures to reflect the lower risk of the business of supplying unbundled network elements at wholesale, which warrants a more leveraged (debt-weighted) capital structure than the businesses he studied. AT&T-WCOM Exh. 10 (Hirshleifer Reb.) at 10.

Dr. Vander Weide's analysis produces a weighted average cost of capital of 12.95 percent, based on a 7.55 percent cost of debt, a 14.75 percent cost of equity, and a debt/equity ratio of 25/75. *Id.*

As explained in the rest of this section, Dr. Vander Weide's latest testimony provides no legitimate reason for rejecting the methodology and results offered by Mr. Hirshleifer, or reconsidering the near-unanimous rejection of Dr. Vander Weide's inflated assumptions by the state commissions in Verizon's service area. The present record confirms anew that a cost of capital in the range of 9.54 percent is reasonable, and the 12.95 percent value proposed by Dr. Vander Weide is grossly excessive, and thus would erect a barrier to competition through the purchase of UNEs, encourage inefficient facilities-based entry, and generate monopoly rents for Verizon.

3. Mr. Hirshleifer's Three-stage DCF Equity Model Is More Realistic Than Dr. Vander Weide's One-stage DCF Equity Model.

The single most significant dispute between Mr. Hirshleifer and Dr. Vander Weide involves the number of stages appropriate for a DCF equity model. This dispute alone accounts for about two percentage points, or more than half of the total difference between the 9.54 percent weighted average cost of capital recommended by Mr. Hirshleifer and the 12.95 percent value recommended by Mr. Hirshleifer. AT&T/WCOM Exh. 17 (Hirshleifer Surreb.) at 11; 12 Tr. 3431, lines 1-9 (Vander Weide).

Mr. Hirshleifer based his DCF cost of equity analysis on a three-stage DCF model, which recognizes that the above-average growth rates projected by I/B/E/S or other analysts for the next 3-5 years will likely regress over time to the long run average growth rate of the entire economy.[43] Mr. Hirshleifer reasonably assumed that, from year 6 to year 20 (from

[43] *See* AT&T-WCOM Exh. 5 (Hirshleifer Dir.) at 12-15; AT&T-WCOM Exh. 10 (Hirshleifer Reb.) at 12-16; AT&T-WCOM Exh. 17 (Hirshleifer Surreb.) at 2-17.

2006 to 2020), the growth rate of telecommunications holding companies will slowly converge to the growth rate of the S&P 500. After year 20 (from 2021 thereafter), Mr. Hirshleifer assumed that growth rates for THCs will equal the growth rate of the rest of the economy. This analysis is called a "three-stage DCF analysis." AT&T-WCOM Exh. 5 (Hirshleifer Dir.) at 15-17.

Dr. Vander Weide, on the other hand, used a one-stage DCF model—implicitly assuming that the above-average 3-5 year growth rates projected by I/B/E/S for the companies in his DCF comparison group will continue forever. 12 Tr. 3427-29 (Vander Weide). It should be obvious to investors that this assumption is an impossibility. The I/B/E/S growth projections for the companies analyzed by Dr. Vander Weide were in the range of 10-11 percent or more per year—nearly *double* the long term rate of corporate growth.[44] Only in Lake Wobegon can the average performance of a large group of companies exceed the long-term historical average for more than a short period. Sooner or later, the rate of earnings growth for the average firm can be expected to regress to the mean as the firm reaches the limits of its potential markets, or succumbs to new competition, technological innovation, management errors, or other constraints on earnings growth. Dr. Vander Weide's approach systematically overstates the future projected earnings of these companies, and thus overstates the discount rate—*i.e.*, cost of equity capital—needed to reduce the present value of those future earnings to the current market price of the company's stock. AT&T-WCOM Exh. 10 (Hirshleifer Reb.) at pp. 12-17.[45]

---

[44] Verizon Exh. 112 (Vander Weide Dir.) at Attachment 7.

[45] The fallacy of Dr. Vander Weide's growth assumptions is easily demonstrated. If *any one* of the companies in Dr. Vander Weide's comparison group sustained growth in excess of the market-wide rate of growth into the long run, that one company would eventually grow to swallow up the entire economy. AT&T-WCOM Exh. 10 (Hirshleifer Reb.) at 13.

Unsurprisingly, the single-stage DCF model has been overwhelmingly rejected by scholars and practitioners in the field of corporate finance. AT&T-WCOM Exh. 5 (Hirshleifer Dir.) at 12-15; AT&T-WCOM Exh. 10 (Hirshleifer Reb.) at pp. 16-17. Indeed, even the investment banks and securities analysts retained by Verizon in recent years have used multi-stage DCF models rather than one-stage models for their analysis. AT&T-WCOM Exh. 17 (Hirshleifer Surreb.) at 6-8. Significantly, neither Dr. Vander Weide nor Verizon was able to identify a single reputable economist who supports a one-stage DCF for companies with above-average short-run growth rates. AT&T-WCOM Exh. 17 (Hirshleifer Surreb.) at 2; Response of Verizon to Staff record request 12 (filed Oct. 10, 2001); 12 Tr. 3440 (Vander Weide) ("I didn't look at the literature."); *id.* at 3438 ("No, I didn't rely on the finance literature.").

In defense of a one-stage DCF, Dr. Vander Weide advanced three main arguments: (1) some companies have historically managed to sustain above-average growth rates for a long time; (2) the number of stages in the DCF model has only a *de minimis* effect on the cost of capital, because the present value of projected earnings in distant years is very small; and (3) whether short-term growth projections are really sustainable over the long run is irrelevant, because investors *believe* that short-term growth projections are sustainable when making investment decisions. None of these defenses withstands scrutiny. We respond to each one in turn.[46]

[46] Dr. Vander Weide also criticizes as arbitrary Mr. Hirshleifer's choice of his three-stage model rather than other multi-stage DCF models that have discussed in the economic literature. Mr. Hirshleifer has explained, however, why the three-stage model is particularly well suited here. In any event, other commonly-used multi-stage models would produce an even lower cost of capital. AT&T-WCOM Exh. 17 (Hirshleifer Surreb.) at 13-17.

a. Above-Average Short-Run Earnings Growth Is Unsustainable In The Long Run.

Dr. Vander Weide's prefiled testimony seizes upon examples of a few companies, like Intel and WalMart, that have managed to sustain above-average growth rates for many years, as evidence that sustained above-average growth is possible. This argument confuses hindsight with foresight, and isolated exceptions with the general rule. Dr. Vander Weide's one-stage DCF model assumes not just that *some* of the companies in his comparison group will beat the pack, but that *all* of the companies in his group, on average, will do so.[47] No large and diverse group of companies like the S&P Industrials has ever managed to beat the average for a sustained period of years; Dr. Vander Weide has been unable to identify a single exception.[48] Indeed, even individual high-fliers sooner or later regress to the mean, as the recent experience of Intel and other tech stocks illustrates.[49]

Moreover, investors do not enjoy Dr. Vander Weide's luxury of 20-20 hindsight: investors must commit and withdraw funds based projections and expectations about the future, not on past history. Because the actual long-run performance of any company can be known for certain only in hindsight, the returns that investors can realistically expect necessarily reflect the likelihood that corporate growth will regress to the mean, not the tulip bubble-like assumptions underlying Dr. Vander Weide's one-stage model.[50]

On cross-examination, Dr. Vander Weide abandoned his claim that above-average rates of earnings growth would actually be sustainable over the long run for his DCF comparison group:

---

[47] *See, e.g.*, AT&T-WCOM Exh. 10 (Hirshleifer Reb.) at pp. 13-15.

[48] AT&T-WCOM Exh. 17 (Hirshleifer Surreb.) at 4-5.

[49] AT&T-WCOM Exh. 17 (Hirshleifer Surreb.) at 3-5; Burton G. Malkiel, *A Random Walk Down Wall Street* 97-99 (1999).

[50] *See* AT&T-WCOM Exh. 17 (Hirshleifer Surreb.) at 2-6.

> MR. LEVY: . . . You're not asking the Commission—you're not offering as a reason for adoption of the one-stage DCF the proposition that, in fact, the companies in your DCF comparison group are likely to grow at an above-average rate for a long period of time?
>
> DR. VANDER WEIDE: That's not my support. My support is I provided evidence that investors *expect* them to grow at above-average rates for a long period of time.
>
> * * *
>
> MR. LEVY: So, whenever in your pre-filed testimony the reader might rightly or wrongly gain the impression that you're testifying about what will actually happen about long-run growth of companies, that should, in fact, be read with a gloss that you're only talking about what investors *expect*?
>
> DR. VANDER WEIDE: Certainly should because my entire testimony, in regards to the cost of capital, has to do with investor expectations.

Tr. 3448, 3543 (emphasis added).

b. The Choice Between The One-Stage And Three-Stage DCF Models Has A Significant Effect On The Estimated Cost of Equity.

Dr. Vander Weide asserts that the assumption of perpetual growth at above-average rates, even if counterfactual, has only a minimal effect on the cost of capital because the present value of earnings more than 40 or 50 years in the future is small.[51] This claim is also without merit.

[51] *See* Verizon Exh. 112 (Vander Weide Reb.) at p. 40. This claim is a retreat from Dr. Vander Weide's position five years ago. In Verizon's 1997 UNE proceeding in Virginia, he argued that the impact on present value of dividend growth rate assumptions became *de minimis* beyond 20 years, not just 40 years. *See* AT&T-WCOM Exh. 10 (Hirshleifer Reb.) at 9-10.

First, Dr. Vander Weide has provided no evidence that the average company in his comparison group will sustain its supra-normal short-term projected growth rate for even 10 or 20 years, let alone 40.[52]

Second, even if the average firm in the S&P 400 were likely to sustain 40 years of above-average growth, the present value of the difference between 40 years of above-average growth and Dr. Vander Weide's assumption of *perpetual* above-average growth is still large. Dr. Vander Weide's assertion that the present value of projected earnings in the distant future is *de minimis* ignores the fact that the passage of time compounds the gross value of future earnings as well as the discount factor used to reduce them to a present value. AT&T-WCOM Exh. 10 (Hirshleifer Reb.) at 15-17.

Mr. Hirshleifer has quantified the net effect. Compared with a growth model that assumes 40 years of sustained above-average growth before reversion to the long-term average growth rate (*i.e.*, a two-stage growth model), the one-stage DCF overstates the cost of equity by at least 150 basis points.[53] Compared with the more conservative assumption that growth would revert to the long-term trend after 20 years, the one-stage, perpetual growth model overstates the cost of equity by 230 basis points.[54]

Compared with the three-stage model, the overstatement produced by the one-stage model is even greater. Dr. Vander Weide has acknowledged that the choice between his one-stage DCF and the three-stage DCF model sponsored by Mr. Hirshleifer accounts for approximately 200 basis points (*i.e.*, two percentage points) of the difference between the cost of equity estimates of the two witnesses. AT&T/WCOM Exh. 17 (Hirshleifer Surreb.) at 11.

---

[52] *See* AT&T-WCOM Exh. 17 (Hirshleifer Surreb.) at 6-7 (citing industry analyst reports whose growth assumptions through 2008 are very conservative).

[53] *Id.* at 9 and Attachment JH-1 thereto.

[54] *Id.* at 9.

c. Dr. Vander Weide's Speculation About Investor Psychology Is Unsupported.

Dr. Vander Weide asserts that the long run sustainability of the above-average rates of earnings growth projected for his DCF comparison group over the next three to five years is irrelevant because the average investor *believes* that short-term growth trends projected by I/B/E/S and Value Line are in fact sustainable in the long run. VZ Exh. 118 (Vander Weide Surreb.) at 39-40. Dr. Vander Weide's speculation about investor psychology is as unsupported as his analysis of actual corporate growth rates.

Both the I/B/E/S and Value Line growth forecasts are explicitly limited to periods of five years and 3-5 years, respectively.[55] Dr. Vander Weide's theory thus necessarily assumes that the investors who use the data—including investment professionals who prepare stock purchase recommendations or manage mutual funds and other pools of institutional investment capital—overlook or deliberately ignore these disclaimers. Dr. Vander Weide has offered no credible support for this assumption.[56]

In his rebuttal and surrebuttal testimony, Dr. Vander Weide asserted that such support appears in data published by Value Line "that can be used to estimate a company's long-run sustainable growth from internal sources." VZ Exh. 112 (Vander Weide rebuttal) at 46 & Rebuttal Schedule 4; VZ Exh. 118 (Vander Weide Surreb.) at 40. These data, however, are no

---

[55] *See* AT&T-WCOM Exh. 17 (Hirshleifer Reb.) at 11-12; 12 Tr. 3457-62 (Vander Weide) (discussing caveats published by Value Line on the period coverd by its financial projections); Exh. AT&T-108 at 920-21 (Value Line caveats); *id.* at 746 (right-hand column) (showing that projections extend only out to the years 2004-06).

[56] The assumption is, of course, fundamentally inconsistent with the DCF and CAPM models, both of which assume rational behavior by investors. 12 Tr. 3685 (Hirshleifer); *compare* VZ Exh. 104 (Vander Weide) at 11-12, 17-18 (defining cost of capital in terms of investors' rational expectations); 12 Tr. 3668, lines 9-12 (Vander Weide) (perpetual growth assumption implies that investors are irrational).

longer-run than any of the other projections published by Value Line or I/B/E/S: like the other data, they purport to apply only for the next 3-5 years. AT&T-WCOM Exh. 17 (Hirshleifer Surreb.) at 11-12.

During cross-examination, Dr. Vander Weide volunteered a journal article he co-authored in 1988, purporting to show that changes in stock prices in the early 1980s correlated closely with changes in short-term earnings projections by analysts, rather than long-term average growth rates. James H. Vander Weide and Willard T. Carleton, "Investor Growth Expectations: Analysts vs. History," *Journal of Portfolio Management* (Spring 1988) at 78 (AT&T Exh. 109); 12 Tr. 3468-69, 3490:4-11 (Oct. 24, 2001). The article, however, does not support the conclusion that Dr. Vander Weide would draw from it today, nearly two decades after the vintage of the data studied in the article.

The corporations reported in the article were all regulated utilities—*i.e.*, companies that generally have *not* generally experienced above-average short-term growth rates. 12 Tr. 3472-73 (Vander Weide). The article does not reveal how many of the companies in the study group were in fact projected to achieve above-average earnings growth in the short run, and Dr. Vander Weide was unable to state whether *any* of the companies were projected to achieve above-average earnings growth. 12 Tr. 3487-89, 3575-76, 3486. Moreover, the early 1980s were a period of double-digit interest rates, a response by investors to the double-digit inflation of the late 1970s.[57] Adjusted for inflation, the projected short-run growth in earnings of the companies he studied during the study period *did not exceed the long run growth in corporate earnings.* Such data obviously reveal nothing about investor expectations during periods when short-term growth projections temporarily exceed the long run trends. Finally, the

[57] *See* Statistical Abstract of the United States (2000), at 487, 521 (Table Nos. 768 and 822); Statistical Abstract of the United States (1997), at 497 (Table No. 752); 12 Tr. 3485-86 (confirming that data studied were from 1981-83).